English Translation of

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[Claims]

[Claim 1]

An electrode foil for an aluminum electrolytic capacitor obtained by applying a mixture of fine particles of at least one kind of metal among Ti, Zr, Hf, Nb, and Al or at least one kind among oxides, nitrides, and carbides of the metal and either a binder or a solvent containing a binder to an Al foil.

[Claim 2]

The electrode foil for an aluminum electrolytic capacitor according to claim 1 obtained by pressurizing the foil obtained according to claim 1.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an electrode foil for an aluminum electrolytic capacitor.

[0002]

[Prior Art]

In recent years, along with miniaturization and weight saving of electric and electronic appliances, miniaturization of aluminum electrolytic capacitors has also been required to a further extent. To miniaturize the aluminum electrolytic

capacitors, it is required to increase the electrostatic capacity per unit area of an electrode foil to be used and various kinds of etching methods have been investigated, however, since dissolution of already etched parts occurs simultaneously at the time of surface enlargement, it is difficult to drastically increase the electrostatic capacity per unit area.

[0003]

[Problem to be Solved by the Invention]

To solve the above-mentioned problem, it has been tried to improve the capacity per unit area by coating the surface with an element having a higher dielectric constant than that of Al in a dry process and the electrode foil is employed for a cathode foil. However, the method is difficult to be applied to an anode and in addition, there is a disadvantage that the cost is high and the productivity is low. Accordingly, it has been desired to develop an electrode foil provided with a remarkably improved electrostatic capacity per unit area at a low cost and high productivity.

[0004]

[Means for Solving the Problem]

The present invention has been accomplished as a result of various investigations carried out for solving the above-mentioned problem, and the invention provides an electrode foil for an aluminum electrolytic capacitor having a high electrostatic capacity per unit area at a low cost and

high productivity. That is, the invention provides an electrode foil for an aluminum electrolytic capacitor obtained by applying a mixture of fine particles of at least one kind of metal among Ti, Zr, Hf, Nb, and Al or at least one kind of among oxides, nitrides, and carbides of the metal and either a binder or a solvent containing a binder to an Al foil. Further, the invention provides the electrode foil for an aluminum electrolytic capacitor according to claim 1, which is obtained by pressurizing the foil obtained in the above-mentioned manner.

[0005]

[Action]

It is supposed that the surface area can be expanded without etching by applying fine particles of Ti, Zr, Hf, Nb, or Al which is generally called as a valve-action metal, to an Al foil interposing a binder and in the case of using fine particles except Al, it is also supposed that the electrostatic capacity per unit area can drastically be increased due to the additional action of the high dielectric constant of the particles. Further, each fine particle is bonded to the Al foil or to one another by the binder, and it is supposed that the bonding force can furthermore be increased by applying pressure or heat. This electrode foil production process is preferable in terms of the cost and productivity since the process requires no special atmosphere control unlike the dry process.

[0006]

[Examples]

Hereinafter, the present invention will be described in detail along with Examples including Conventional Examples.

[Example 1]

After fine particles of zirconium oxide were mixed with water containing polyvinyl alcohol, the resulting mixture was applied to an Al foil and dried. After that, the foil was rolled at a pressure of 1 ton and subjected to a heat treatment at 500°C to obtain a sample piece. The sample piece was subjected to a chemical conversion treatment to have a breakdown voltage of 22V.

[Example 2]

After fine particles of titanium nitride were mixed with water containing polyvinyl alcohol, the resulting mixture was applied to an Al foil and dried. After that, the foil was rolled at a pressure of 1 ton and subjected to a heat treatment at 500°C.

[Conventional Example 1]

After prescribed etching for an anode was carried out for an aluminum foil with 99.98% purity, the foil was subjected to a chemical conversion treatment to have a breakdown voltage of 22V.

[Conventional Example 2]

Prescribed etching for a cathode was carried out for an aluminum foil with 99.80% purity. The results of these foils

are shown in Table 1.

[0007]

[Table 1]

		Electrostatic capacity ($\mu F/cm^2$)	Breakdown voltage (V)
Example 1	Anode foil	152.0	22.5
Conventional Example 1	Anode foil	72.5	22.1
Example 2	Cathode foil	1253.0	0.7
Conventional Example 2	Cathode foil	420.3	0.5

(Number of samples: n = 30, average value)

[0008]

In Table 1, when comparing Conventional Examples 1 and 2 with Examples 1 and 2 for which the technique of the present invention was employed, it was found that the electrostatic capacity was remarkably increased in Examples 1 and 2. The breakdown voltage was almost the same as that in the case of carrying out a chemical conversion treatment.

[0009]

In this connection, although Zr oxide and Ti nitride were used in the above-mentioned Examples, similar effects can be caused also in the case of using a metal such as Ti, Zr, Hf, Nb, or Al alone, or one kind or a combination of two or more kinds of fine particles of oxides, nitrides, and/or carbides of the metal.

[0010]

[Effects of the Invention]

With the electrode foil for an aluminum electrolytic

capacitor according to the present invention, it is possible to remarkably increase the electrostatic capacity per unit area and the invention is greatly advantageous in terms of the effect.